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Danaus Plexippus in Bermuda in September 1970

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Thousands of Monarch Butterflies were reported to have been seen in the afternoon and evening of 4 September 1970 in Bermuda, many of which were observed flying in over the coast from an easterly point. This report was provided by Hughes (1970), and the present account stemmed from discussions with Mr R A French of Rothampstead, who drew attention to the flight and to many points of interest. The butterflies were obviously immigrants, and Atlantic synoptic charts were examined to trace their probable origin. The amount of meteorological data available to the writer was rather restricted, but the surface analysis of the situation in the area is in no real doubt. The only upper air chart readily available was that for 500 mb (5000 m) but there is no reason to doubt that the flight was in fact executed at low level.

The trajectory was established in the usual way with an assumed arrival time of 1800/4 September; all times are given in GMT, unless stated to the contrary. Near Bermuda winds were very light at first, and probably from east or northeast, and the position for 0000/4 was calculated to be only above 90 nm (160 km) northeast of Bermuda. From this point back, winds freshened a little and backed as more definite north-northeast, and later north-northwest winds blew, and the 0000/3 estimate was about 250 nm (450 km) further north. During 2 September the winds backed to northwest and freshened, and the 0000/2 position was a further 420 nm (800 km) back, only just off the American coast of New England. Departure at say 1800-2100/1 (1300-1600 local time) from Massachusetts or neighbouring areas seems probable. In view of the uncertainty of winds near Bermuda, the departure area may not be critical, and anywhere between New York and the south of Nova Scotia would be acceptable meteorologically. Biologically, the explanation is also satisfactory as the Monarchs would be in this general area, and their autumn southerly migration would be imminent, as weather became colder and days shorter.

It is instructive to go through events from late August over America and subsequently over the west Atlantic. Over eastern America the latter part of August had been fairly settled and dry apart from a little rain on 29th; day temperatures inland in Massachusetts 27-29th were in the upper 80s or even 90°F (30-33°C). On 30 August, a depression just southwest of Newfoundland moved into the Atlantic, with a weak frontal linkage across the east coast of the United States near Virginia to another depression over Lake Superior. By 1200/31 the second depression had deepened a few millibars and had moved to the mouth of the St Lawrence. A marked cold front was just clearing the coast of New England with northerlies replacing the warm air, and a mobile anticyclone had moved from near the Rockies to just west of the Great Lakes (Figure 1). Following the passage of the cold front, temperatures fell abruptly, and subsequent day maxima inland rose only to the 75-80°F (about 25°C). This probably represented the first departure opportunity of the Monarchs, and indeed no doubt many were swept south or southeastwards to sea, eventually to perish. A trajectory covering this event is shown in Figure 1.

/Much

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Much the same northerly airstream existed on 1 September (Figure 2) with temperatures at about the same level, and no doubt many more Monarchs started southerly flights during the day, probably leaving again in the afternoon. On this occasion, the trajectory was no longer east over the Atlantic; with the continued movement of the anticyclone southeast towards Virginia by 1200/2 (Figure 3) the depression system moved away to the east of Newfoundland, and much lighter winds continued to blow, now from the northwest. By 1200/3 (Figure 4), the anticyclone had moved to just off the east coast of America (Figure 4), and the original depression was approaching south Greenland; the anticyclone was now the dominant feature for the Bermuda-bound Monarchs. Finally, Figure 5 shows the situation on 4 September, with the anticyclone now very slow moving and with almost stagnant winds in the vicinity of Bermuda.

The thousands of Monarchs which arrived in Bermuda must have been the very tiny proportion of survivors of large numbers which left the northeast of the United States on 31 August and 1 September - tiny, as those which did not reach the small island of Bermuda did not reach land at all.

REFERENCE

Hughes, I. W. (1970) Insect migrations in Bermuda. Monthly bulletin of Bermuda Department of Agriculture. 40: 11. 83-86.

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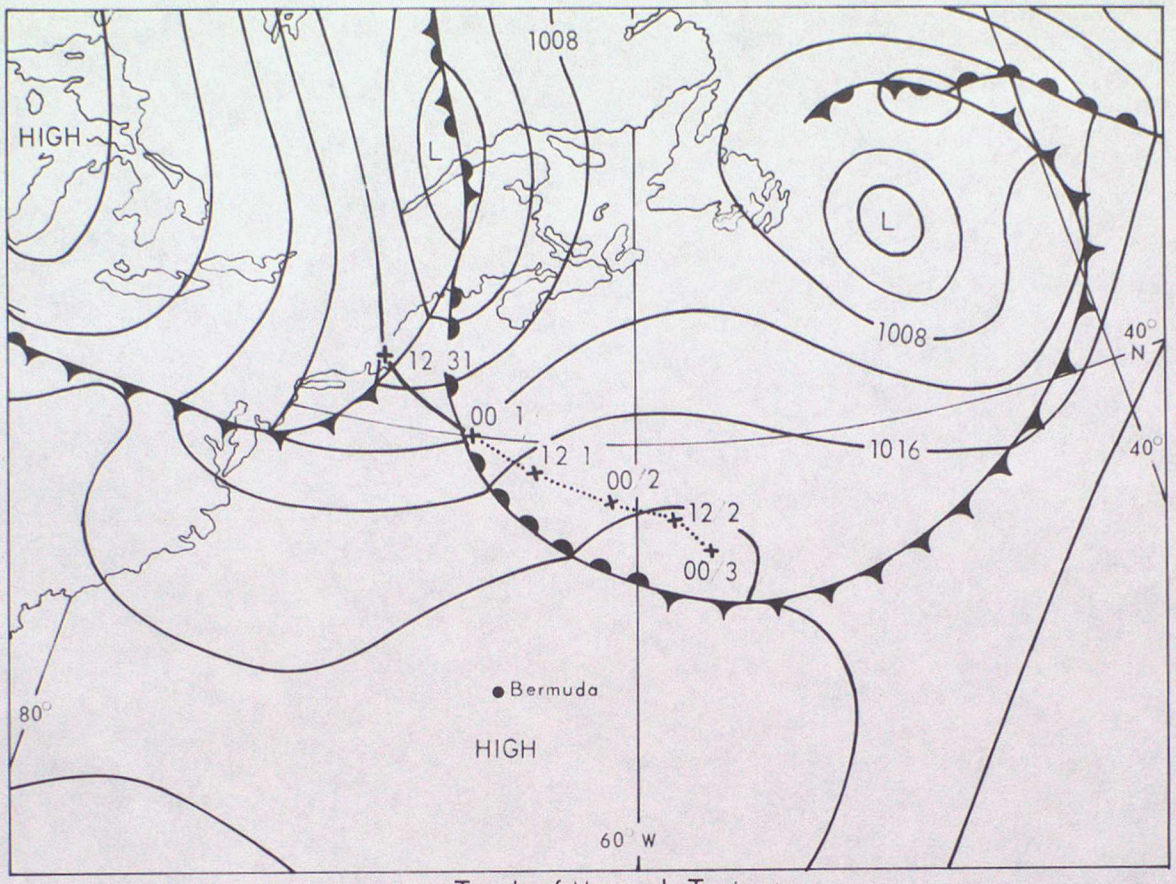


Figure 1 1200 GMT 31 AUGUST 1970 Monarch Trajectory

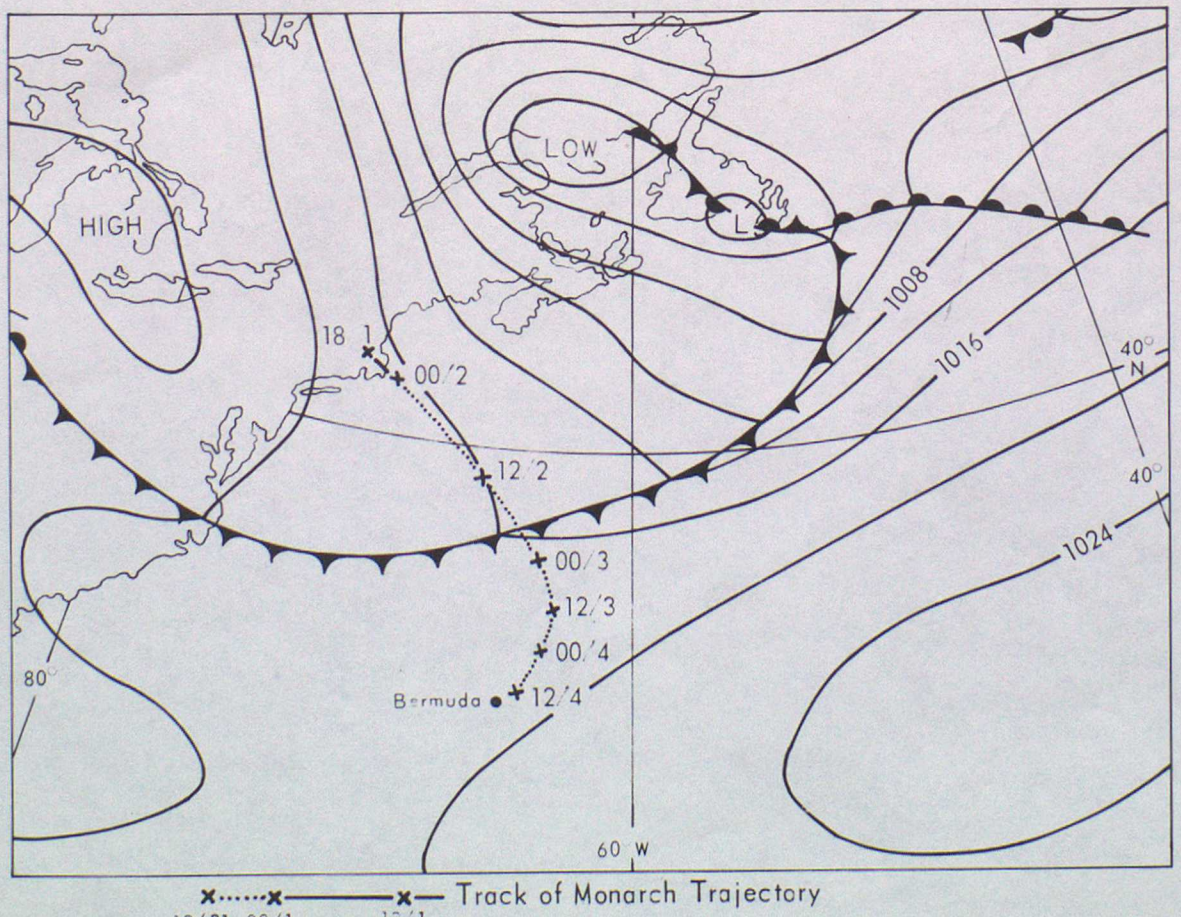
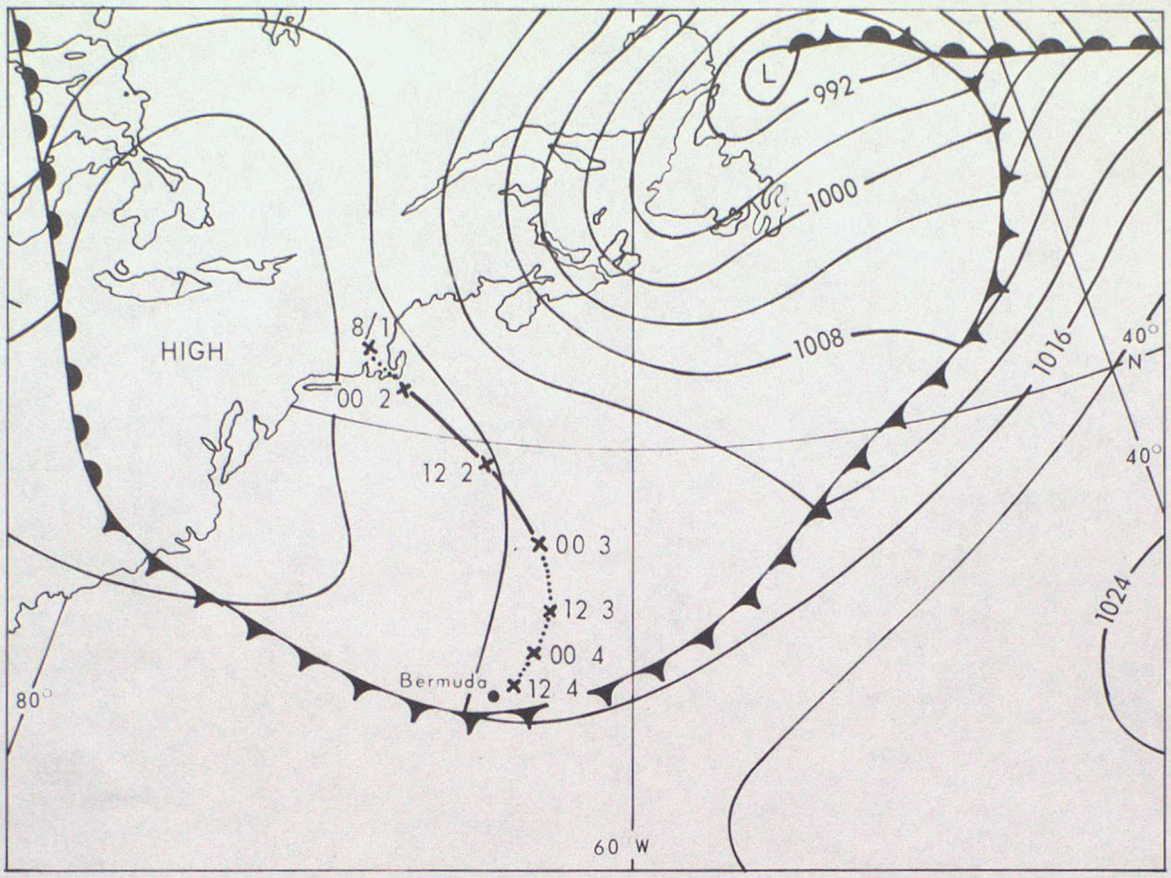


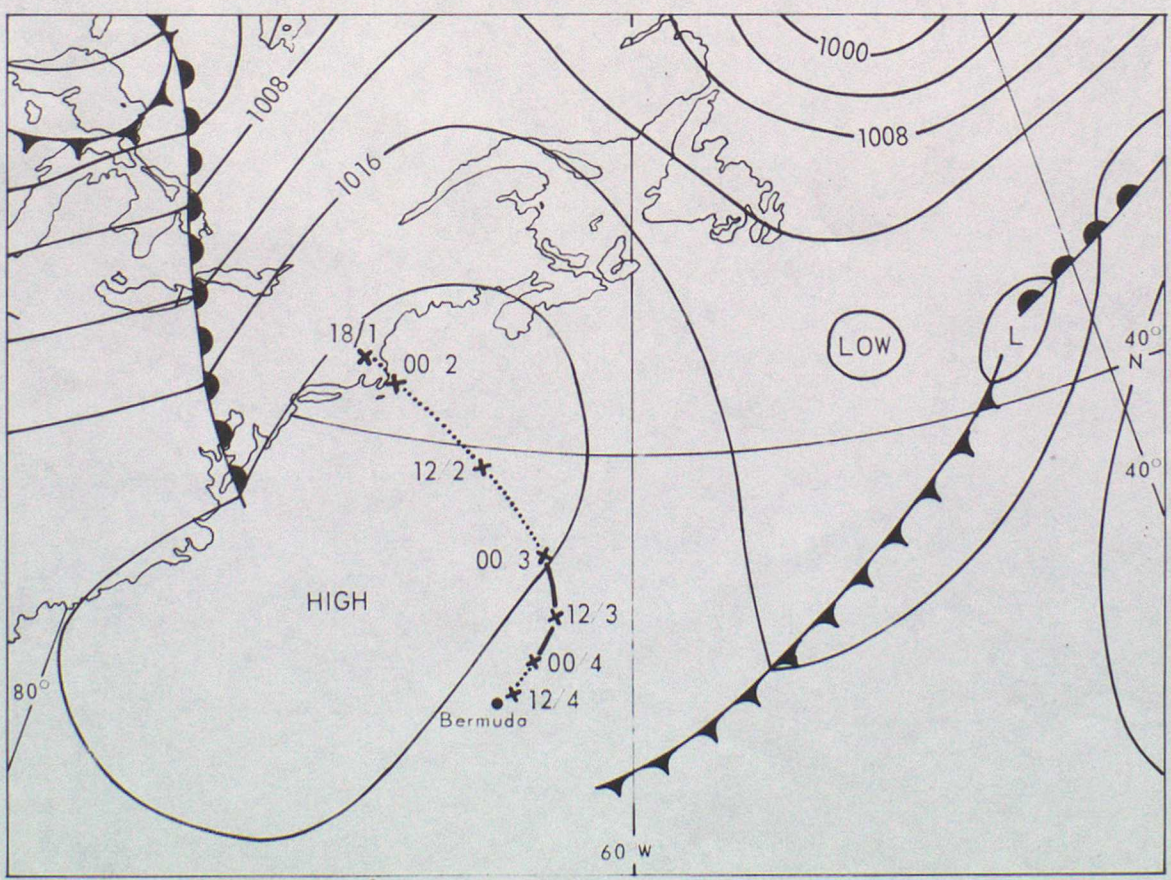
Figure 2 1200 GMT 1 SEPTEMBER 1970 Monarch Trajectory



Track of Monarch Trajectory

12/1 00/2 12/2

Figure 3 1200 GMT 2 SEPTEMBER 1970 Monarch Trajectory



Track of Monarch Trajectory

12/2 00/3 12/3

Figure 4 1200 GMT 3 SEPTEMBER 1970 Monarch Trajectory

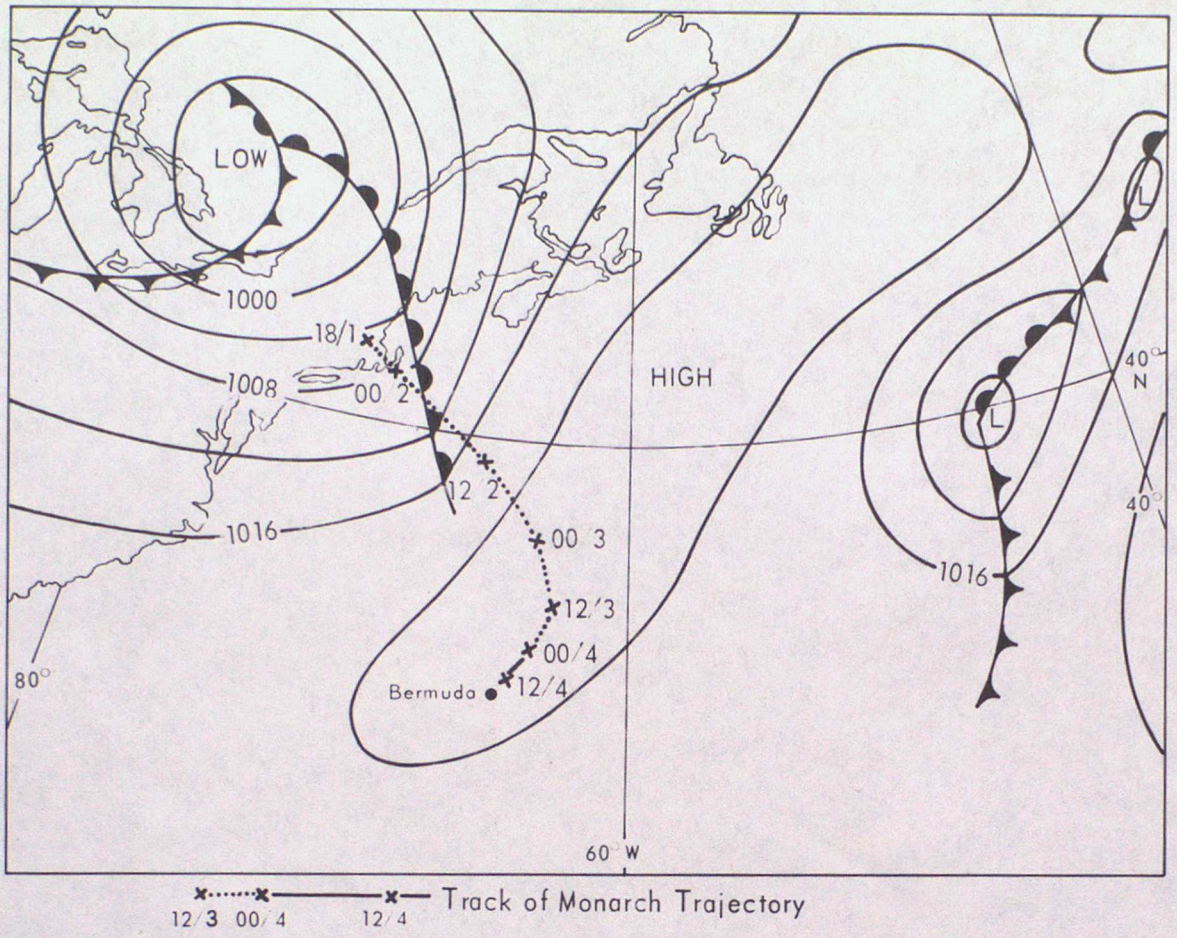


Figure 5 1200 GMT 4 SEPTEMBER 1970 Monarch Trajectory